1. Composition of matter comprising fullerenes having a molecular weight less than that of C_{60} with the exception of C_{36}.

2. Composition of matter comprising fullerene C_{50}.

3. Composition of matter comprising fullerene C_{58}.

4. Composition of matter comprising fullerene C_{130}.

5. Composition of matter comprising fullerene C_{176}.

6. Isolated fullerene C_{50}.

7. Isolated fullerene C_{58}.

8. Isolated fullerene C_{130}.

9. Isolated fullerene C_{176}.

10. Fullerenic structure chemically bonded to a carbon surface.

11. The fullerenic structure of claim 10 wherein the fullerenic structure is C_{60}.

12. The fullerenic structure of claim 11 wherein fullerene C_{60} is chemically bonded to carbon black.

13. The fullerenic structure of claim 12 wherein the fullerene C_{60} is chemically bonded to carbon black by a carbon atom bridged to two carbon atoms of the fullerene and two carbon atoms of a carbon black.

14. Method for tethering a fullerene to a carbon material comprising:

adding functionalized fullerene to a liquid suspension containing carbon material;
drying the suspension to produce a powder; and
heat treating the powder.

15. The method of claim 14 wherein the functionalized fullerene is dichloromethano [60] fullerene.

16. The method of claim 14 wherein the functionalized fullerene is dibromomethano [60] fullerene.

17. The method of claim 14 further including sealing the powder in a tube filled with an inert gas.

18. The method of claim 17 wherein the tube is heat treated in a furnace.

19. The method of claim 18 wherein the tube is heat treated at approximately 400°C for 4.5 hours.

20. The method of claim 14 wherein the carbon material is a fullerene.

21. The method of claim 14 wherein the carbon material is a fullerene derivative.

22. The method of claim 21 wherein the fullerene derivative includes an endohedral fullerene.

23. The method of claim 21 wherein the fullerene derivative includes a metallized fullerene.

24. The method of claim 14 wherein the carbon material is a fullerenic nanostructure including single-walled and multi-walled carbon nanotubes.

25. The method of claim 14 wherein the carbon material is a nested or onion structure.

26. The method of claim 14 wherein the carbon material is spheroidal, ellipsoidal, trigonous-shaped fullerenic structures.

27. The method of claim 14 wherein the carbon material comprises single and multi-layered open cage structures having a range of radii of curvature.

28. The method of claim 14 wherein the carbon material is fullerenic soot.

29. The method of claim 14 wherein the carbon material is fullerenic black.

30. The method of claim 14 wherein the carbon material is graphitic carbon.

31. The method of claim 14 wherein the carbon material is diamond.

32. The method of claim 14 wherein the carbon material is diamond-like carbon.

33. The method of claim 14 wherein the carbon material is amorphous carbon.

34. The method of claim 14 wherein the functionalized fullerene contains a functional group selected to give the functionalized fullerene and a surface of the material to which it is tethered a desired property.

35. The method of claim 34 wherein the desired property is selected from the group consisting of acidic, basic, hydrophilic, hydrophobic, oxidizing, reducing, radical, metallic, electrical, magnetic, structural, chemical, biological, or physical properties.

36. The method of claim 14 further including use of chemical chains selected to achieve a desired tethered length.

37. The method of claim 14 further including use of chemical structures selected to achieve a desired tether stiffness.

38. The method of claim 37 wherein the chemical structures comprise alkane, alkene, alkyne, fused or cross-linked aromatic.

39. The method of claim 14 further including chemical structures selected to achieve a desired electrical conductivity.

40. Single-walled carbon nanotube having a diameter less than that of C_{60} and not associated with a three-dimensional support matrix.